

*Motion Without Limits®*



**INNOVATION is TIMELESS**

**DUALVEE®**

*ORIGINAL Vee Guide Wheels and Components*

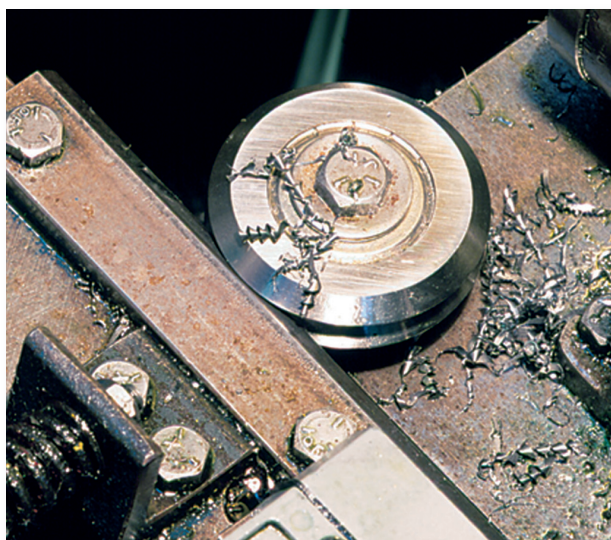
**BISHOPWISECARVER®**



Bishop-Wisecarver is recognized as the market leader for guide wheel technology. In 1968, Bud Wisecarver invented DualVee Motion Technology (DMT) to provide a solution for harsh environment applications where existing technologies were ineffective. DualVee also proved excellent for long length, smooth motion and low noise requirements.

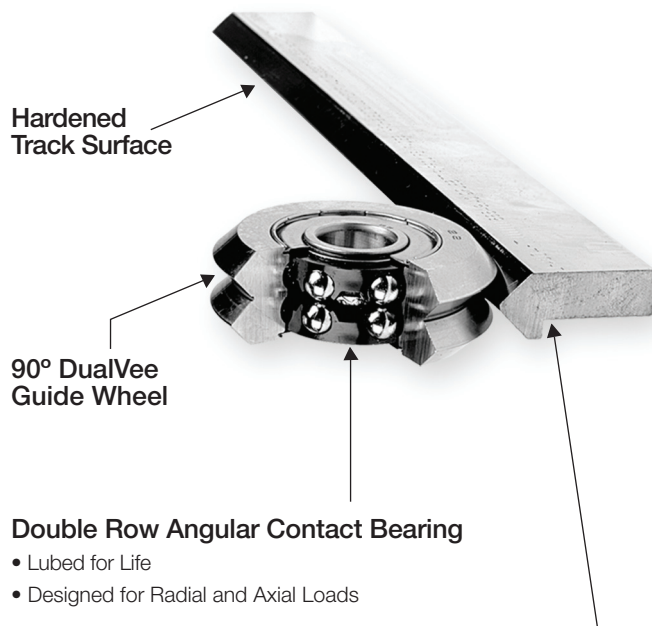
More than 40 years later, our wide range of linear motion components and systems provide time proven, economical solutions for all types of application environments. From clean room to high debris applications, Bishop-Wisecarver has the linear solution to fit your needs.

- Carbon, Stainless Steel, or Polymer Components
- Speeds up to 5.5 Meters/sec
- Acceleration up to 5 g's
- High Accuracy and Repeatability
- High Temperature, Clean Room Options
- Ground Mounting Surfaces not Required
- Low Noise
- Smooth, Low Friction Motion
- Long Lengths



#### Designed for Dirty and Severe Environments

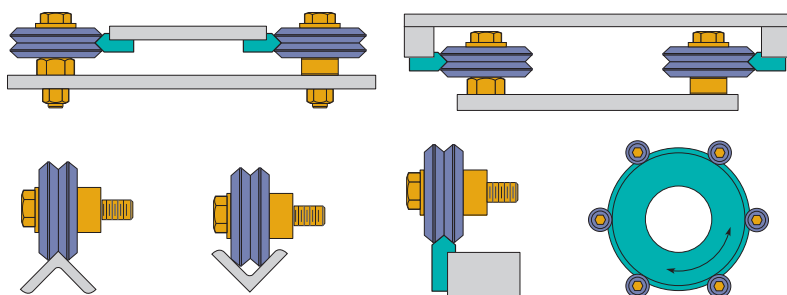
The 90° DualVee design creates a velocity gradient, since the circumference of the wheel is greater at the major diameter, resulting in a constant sweeping action that cleans debris from the track.



#### Mounting Shoulder

- Quick and Accurate Installation
- Unlimited Travel Lengths
- Easily Joined Track

### Typical Mountings



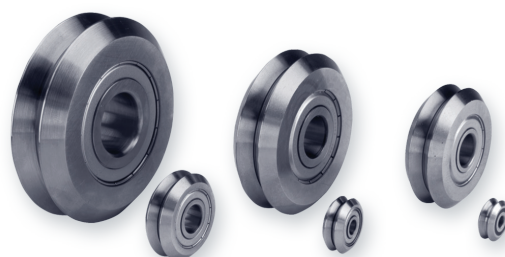
**Application and Design Assistance**  
 888.580.8272 925.439.8272

**3D Modeling and CAD Drawings**  
[www.bwc.com/3dcad.php](http://www.bwc.com/3dcad.php)

\*For a complete range of available options, please refer to the full line DualVee catalog.

# Original DualVee Guide Wheels

- 52100 carbon steel or 440C stainless steel from stock
- Shielded or sealed to protect against contamination
- Inside or outside vee surface can be employed to support loads



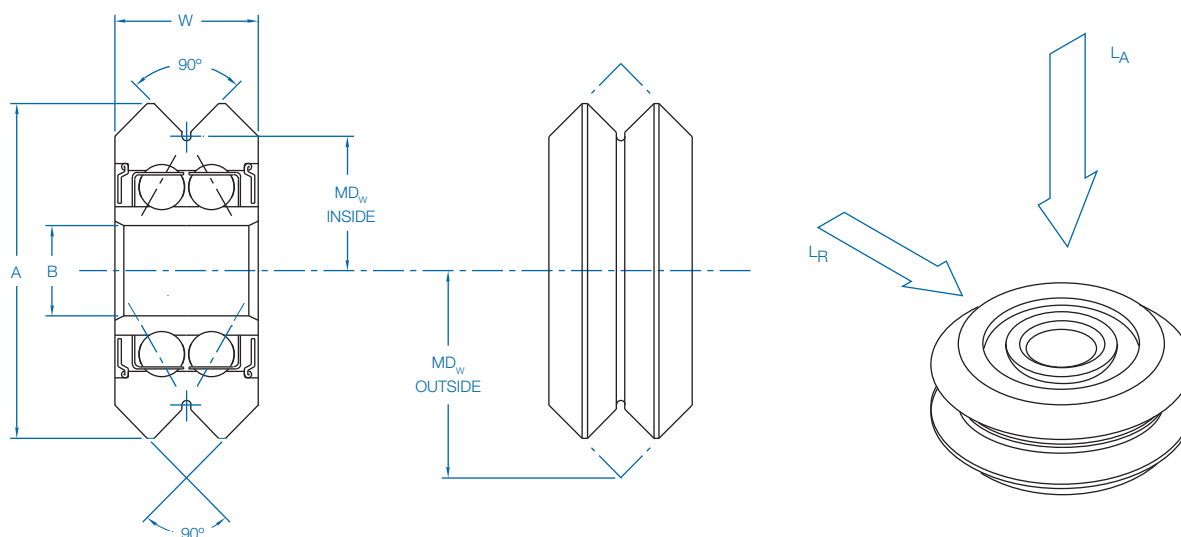
## Load Capacities

Size	Part Number			Radial $L_R$		Axial $L_A$		Weight in Grams
	Shielded	Sealed	Sealed SS	N	lbf	N	lbf	
1	W1	W1X	W1SSX	1220	274	252	57	11.1
2	W2	W2X	W2SSX	2650	596	625	141	39.0
3	W3	W3X	W3SSX	5900	1326	1701	382	130.2
4	W4	W4X	W4SSX	9700	2181	4001	900	276.0
4XL	N/A	W4XXL	W4SSXXL	14300	3215	6552	1473	575.0

## Dimensions

Size	Outside Diameter A	Bore Size B	Width W	Inside Vee Radius $MD_w$ Inside	Outside Vee Radius $MD_w$ Outside
1	.771	.1875	.310	.313	.468
2	1.210	.3750	.438	.500	.719
3	1.803	.4724	.625	.750	1.063
4	2.360	.5906	.750	1.000	1.375
4XL	2.968	.8661	1.000	1.250	1.750

All values are in inches. Guide Wheels are manufactured to ABEC 1.

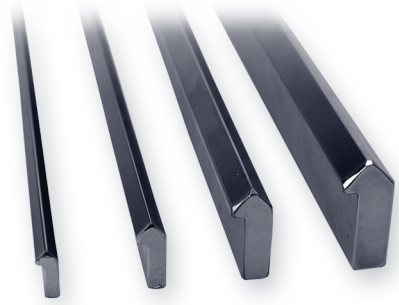


## Notes

Integral, swaged, clean room compatible, and size 0 wheels are also available. Please refer to the full line DualVee catalog for complete information.

## Single Edge Track

- AISI 1045 carbon steel hardened to a minimum of 53 HRC, polished and oiled, or unhardened (22-25 HRC), as formed, oiled
- AISI 420 stainless steel hardened to a minimum of 40 HRC, polished and oiled, or unhardened (20-23 HRC), as formed, oiled
- Maximum single piece lengths up to 20 feet hardened and 22 feet unhardened, easily butt-joined for longer lengths
- Mounting shoulder allows for accurate positioning of vee ways



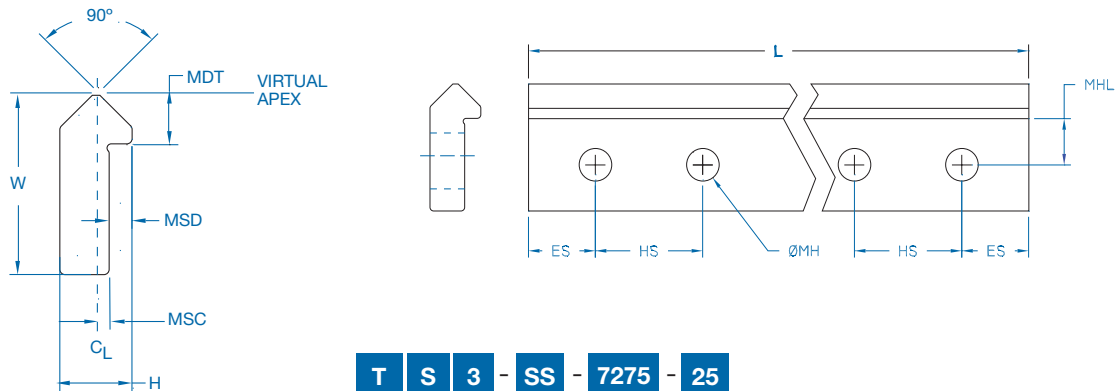
### Drilled and Undrilled Dimensions

Size	Width	Height	Mounting Shoulder Location	Mounting Shoulder to Center Line	Mounting Shoulder Depth	Drilled Track Hole Dimensions				Weight
						End Hole Spacing	Hole to Hole Spacing	Hole Size Thru (Diameter)	Mounting Hole Location	
	W	H	MDT	MSC	MSD	ES	HS	MH	MHL	(lbs./ft)
1	.437	.187	.125	.031	.062	.250	2.000	.156	.156	.183
2	.625	.250	.187	.031	.094	.315	3.000	.203	.219	.343
3	.875	.343	.250	.062	.109	.375	3.000	.281	.313	.690
4	1.062	.437	.312	.093	.125	.500	4.000	.344	.375	1.100

### Standard Lengths – Drilled Track

T1		T2		T3		T4	
Length	# Holes	Length	# Holes	Length	# Holes	Length	# Holes
12.50	7	12.63	5	12.75	5	13.00	4
24.50	13	24.63	9	24.75	9	25.00	7
36.50	19	36.63	13	36.75	13	37.00	10
48.50	25	48.63	17	48.75	17	49.00	13
60.50	31	60.63	21	60.75	21	61.00	16
72.50	37	72.63	25	72.75	25	73.00	19

Values are in inches



**Blank**=Hardened, **S**=Unhardened

Size: **1, 2, 3, or 4**

Material: **Blank**=1045 Carbon Steel  
**SS**=420 Stainless Steel

**Number of Holes (Drilled Track Only)**  
(See table above for standard lengths)

Length - **XX** (feet) for undrilled - 1 foot increments  
**XXXX** (inches x 100) for drilled  
(See table above for standard lengths)

**Examples:** TS3-SS-7275-25 = Unhardened, Size 3, Stainless Steel, 72.75 inches long, 25 holes drilled along the track length  
T2-SS-12 = Hardened, Size 2, Stainless Steel, 12 feet long, Undrilled  
T1-20 = Hardened, Size 1, 20 feet long, Undrilled

### Notes

- The overall length tolerance is  $\pm 0.015$  inches for drilled track and  $\pm 0.0625$  inches for undrilled track.
- Non-standard hole patterns can be accommodated. Non-standard track options are quoted upon request.
- For non-standard track lengths or other non-standard options, contact Bishop-Wisecarver for quotation.
- Size 0 double edge track is also available. Please refer to the full line DualVee catalog for complete information.

## Support Bushings

- Standard material is 303 stainless steel for standard and low profile bushings
- Concentric and eccentric configurations allow for fit up adjustment



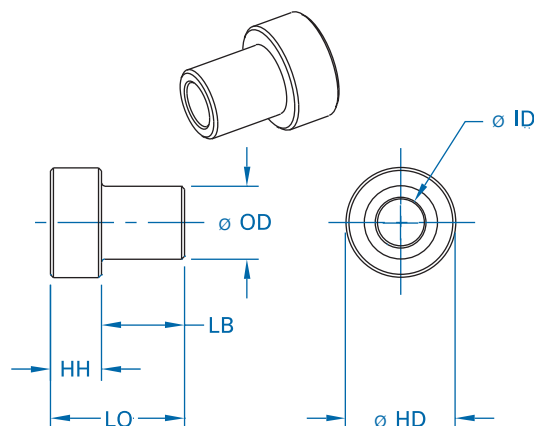
### Standard Profile

DualVee Size	Part Number	Recommended Fastener Size	Hex Size	Offset	Head Height	Length Body	Length Overall	Outside Diameter	Inside Diameter	Head Diameter	Weight in Grams
			HS	EC	HH	LB	LO	OD	ID	HD	
1	B1SS	#6	-	-	.250	.300	.550	.1873	.1406	.44	4.6
	BX1SS	#6	7/16	.012						-	5.1
2	B2SS	1/4	-	-	.281	.425	.706	.3748	.250	.56	10.3
	BX2SS	1/4	9/16	.024						-	11.0
3	B3SS	5/16	-	-	.375	.615	.990	.4722	.3125	.75	25.0
	BX3SS	5/16	3/4	.042						-	27.1
4	B4SS	3/8	-	-	.437	.740	1.177	.5904	.375	.88	42.4
	BX4SS	3/8	7/8	.060						-	45.6
4XL	B4XLSS	9/16	-	-	.565	.990	1.555	.8650	.5625	1.25	112.8
	BX4XLSS	9/16	1 1/4	.060						-	121.4

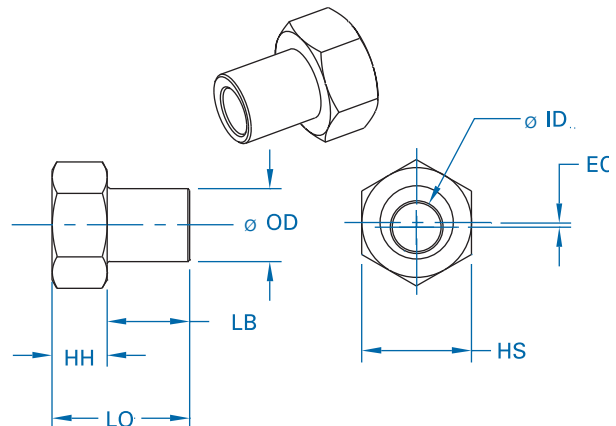
### Low Profile

DualVee Size	Part Number	Recommended Fastener Size	Hex Size	Offset	Head Height	Length Body	Length Overall	Outside Diameter	Inside Diameter	Head Diameter	Weight in Grams
			HS	EC	HH	LB	LO	OD	ID	HD	
1	1PWBC	M4 (Metric)	-	-	.080	.300	.380	.1873	.157	.44	1.5
	1PWBX	M4 (Metric)	7/16	.007						-	1.6
2	2PWBC	1/4	-	-	.100	.425	.525	.3748	.250	.56	5.7
	2PWBX	1/4	9/16	.024						-	6.0
3	3PWBC	5/16	-	-	.125	.615	.740	.4722	.3125	.75	13.4
	3PWBX	5/16	3/4	.042						-	14.1
4	4PWBC	3/8	-	-	.125	.740	.865	.5904	.375	.88	23.0
	4PWBX	3/8	7/8	.060						-	24.0
4XL	4XLPWBC	9/16	-	-	.188	.990	1.178	.8650	.5625	1.25	68.2
	4XLPWBX	9/16	1 1/4	.060						-	70.9

Values are in inches unless otherwise noted



Concentric<sup>1</sup>



Eccentric

### Notes

- Drawing shown above is a standard profile support bushing. Please refer to the full line DualVee catalog to view additional drawings.

## Mounting Dimensions/Formula

### DualVee-based Wheel Plate and Track Plate Assemblies

When fabricating a DualVee linear guide from componentry, the following (formulae) are applicable for mating carriage plate and track plate designs:

#### Size 1 to 4XL

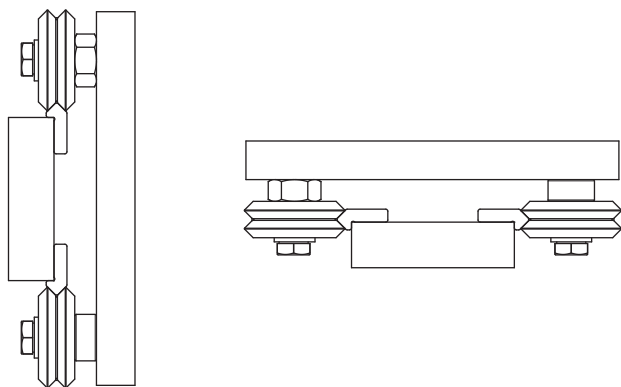
For sizes 1 through 4 DualVee single edge track with equivalent sized guide wheels:

- Inboard Mounting (See Figure 1):  $A = B + X$
- Outboard Mounting (See Figure 2):  $A = C - X$
- Exterior Mounting (See Figure 3):  $A = D - Y$

A = hole centers for wheel plate

#### Mounting Constants

DualVee Size	X		Y	
	inch	mm	inch	mm
1	.874	22.20	.934	23.72
2	1.374	34.90	1.436	36.47
3	2.000	50.80	2.124	53.95
4	2.624	66.60	2.750	69.85
4XL	3.124	79.35	3.500	88.90



#### Suitable for Radial or Axial Mounting

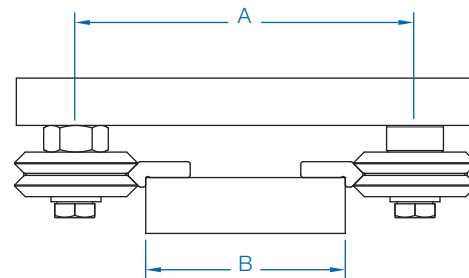


Figure 1 Inboard Mounting

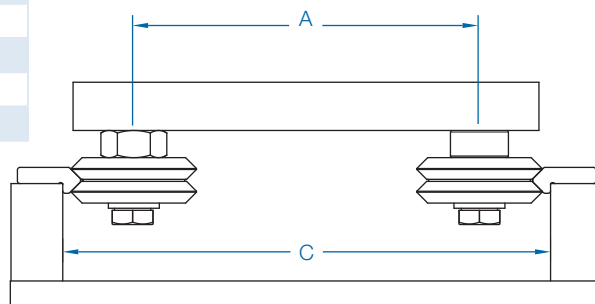


Figure 2 Outboard Mounting

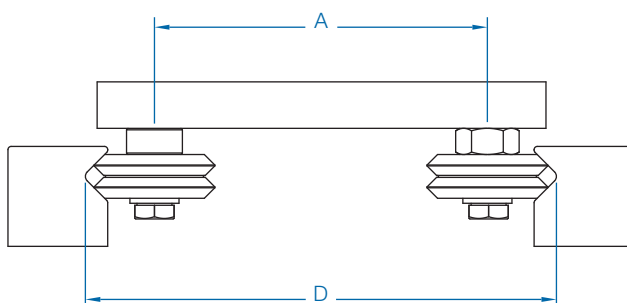


Figure 3 Exterior Mounting

#### Notes

- Information above uses the same size DualVee track and wheel except for size 4XL which uses W4XXL guide wheel with size T4 track.
- Side views shown only, length of wheel plates can be any length required.
- It is recommended that wheel plates be constructed with concentric bushings on one side of the plate and eccentric bushings on the opposing side.
- "D" dimension is to the theoretical sharp of the 90° angle.
- For complete technical reference details, please visit our website at [www.bwc.com](http://www.bwc.com).

## Load/Life Equation – Sizing and Selection

### Step 1: Calculate loads on each bearing

Given below are force equations for some common configurations.

$F_A$  = Axial Force,  $F_R$  = Radial Force

#### Scenario 1

$$F_{A1} = \frac{F(x-a)}{x}$$

$$F_{A2} = \frac{Fa}{x}$$

#### Scenario 2

$$F_{A1} = \frac{F(x+a)}{x}$$

$$F_{A2} = \frac{-Fa}{x}$$

#### Scenario 3

$$F_{A1} = \frac{Fx}{y}$$

$$F_{A2} = \frac{-Fx}{y}$$

$$F_{R1} = F$$

\*Note: Since carriages use 4 wheels, 2 wheels absorb the load at both points 1 & 2, divide the calculated load by 2 to obtain the load on each wheel.

#### Example: Scenario 3

$$F = 200 \text{ lbs}$$

$$x = 15 \text{ inches}$$

$$y = 5 \text{ inches}$$

$$F_{A1} = \frac{200(15)}{5} = 600 \text{ lbs, or } 300 \text{ lbs per wheel}$$

$$F_{A2} = \frac{-200(15)}{5} = -600 \text{ lbs, or } -300 \text{ lbs per wheel}$$

$$F_{R1} = 200 \text{ lbs, or } 100 \text{ lbs per wheel}$$

**Step 2: Calculate the load factor  $L_F$  for the most heavily loaded bearing using the above example with size W4X guide wheel,  $F_{A(max)}$  and  $F_{R(max)}$  from load rating chart pg 1.**

$$L_F = F_A / F_{A(max)} + F_R / F_{R(max)}$$

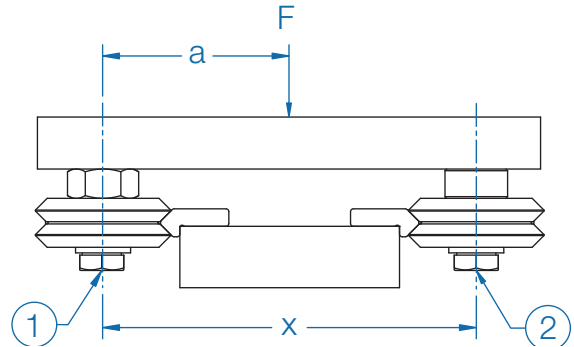
$$L_F = 300 / 900 + 100 / 2181 = 0.38$$

### Step 3: Calculate life estimate

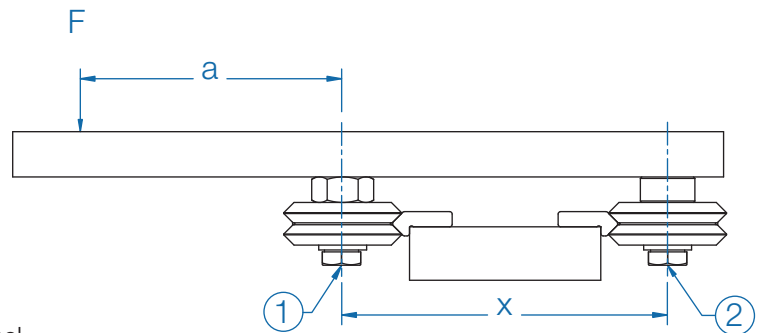
#### $A_F$ assumed at 1

$$\text{Life} = [L_C / (L_F)^3] A_F = [6.84 \times 10^6 / (0.38)^3] \times 1 = 124.7 \times 10^6 \text{ inches}$$

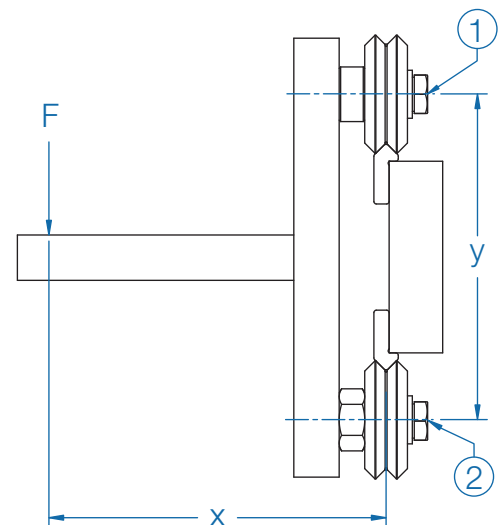
For further discussion on load/life relationship, please refer to the full line DualVee catalog.



Scenario 1



Scenario 2



Scenario 3



Complete DualVee product information, including integral wheels, studed wheel assemblies, journal assemblies, size 0 wheels and track, clean room, high temperature, and custom options are available in the full line DualVee catalog. Visit [www.bwc.com/products/dual-vee.html](http://www.bwc.com/products/dual-vee.html) or call for more information.

### 3D CAD DRAWINGS

Download 3D CAD files for our complete product line at [www.bwc.com/3dcad.php](http://www.bwc.com/3dcad.php).

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### PRODUCT ORDERS

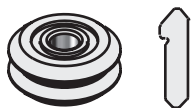
Please call Bishop-Wisecarver with your specific application requirements. Our technical staff is available to assist with your custom solution.

Bishop-Wisecarver provides a written three year limited warranty on our Swiss bearings and a written one year limited warranty on all other products, assuring the customer that its products conform to published specifications and are free from defects in material or workmanship.

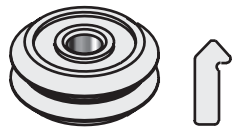
Complete terms and conditions and warranty information is available at [www.bwc.com/about\\_conditions.vp.html](http://www.bwc.com/about_conditions.vp.html).

## DualVee Wheels and Track

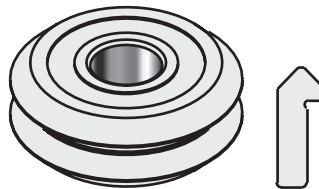
(actual size shown)



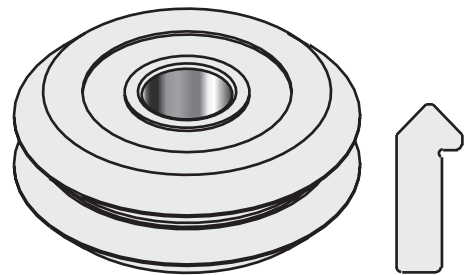
**Size 0**  
**Wheel & Track**



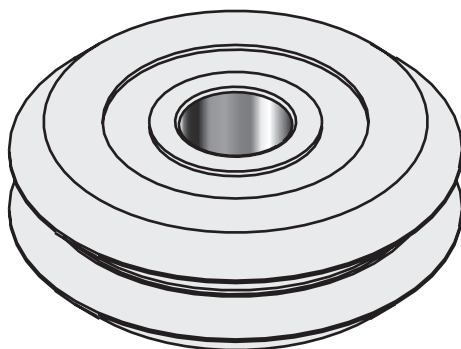
**Size 1**  
**Wheel & Track**



**Size 2**  
**Wheel & Track**



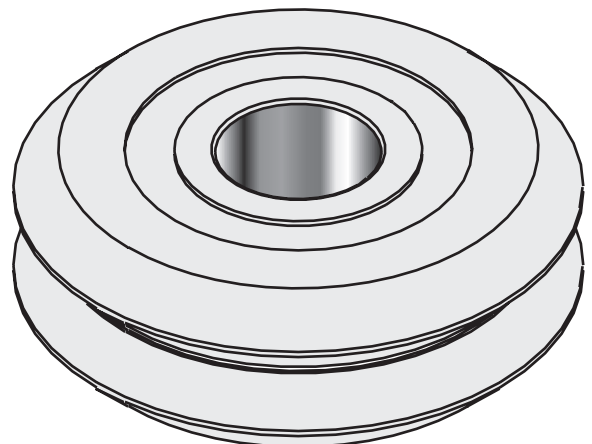
**Size 3**  
**Wheel & Track**



**Size 4 Wheel**



**Size 4 Track**



**Size 4XL Wheel**